Fabriques is afforded by a ponderous volume, the second edition of which has been received from the Association. The volume is entitled "Collection of Appliances and Apparatus for the Prevention of Accidents in Factories." It is illustrated by thirty-seven finely-drawn plates, and the text is printed in French, German, and English. The London agents are Messrs. Dulau and Co. What strikingly indicates the high motives which actuate the Association is that the volume is published at the price it cost to reproduce. The one object of publication is to spread the knowledge, and encourage the adoption, of the numerous appliances devised for the prevention of accidents from machinery. The factory inspector and manager, the mechanical engineer, and all others who are concerned in the construction and use of machinery, should see this very useful volume.

We have received the first two numbers (1892–1893) of the yearly *Bulletin of the Geological Institution of the University of Upsala*. This is a publication that should be of great interest to all British geologists whose work lies among the Lower Palæozoic rocks, since on those strata Swedish researches have thrown so much light. Among the contents are two papers by C. Wiman, on the structure of Graptolites; stratigraphical papers, by the same author, and J. G. Andersson; petrographical and mineralogical papers, by Prof. Nordenskiold and H. Sjögren; and others. Nine plates in all, illustrate the numbers. The papers are all in either English or German (French is the only other language permitted); this will be satisfactory to those British geologists who have found the Swedish language a serious barrier to the study of important geological papers in the past. We may add that the *Bulletin* will be sent, not only to all geological institutions, but also to all private workers who send their publications regularly in exchange.

Among the new editions received during the past week, is the second edition of the "Introduction to Physiological Psychology" (Swan Sonnenschein and Co.), translated from the revised and enlarged second German edition of Dr. Trichen's work, reviewed in these columns four years ago (vol. xliv. p. 145). The chief addition is a chapter upon the emotional tone of the ideas. Another new edition (the fourth), just received, is "A Treatise on Elementary Trigonometry" (Longmans, Green, and Co.), by Dr. John Casey, F.R.S., edited by Prof. P. A. E. Dowling. This little work has found favour among many teachers and students, and the new issue should be even more popular. Dr. W. H. Besant's "Conic Sections" (George Bell and Sons) has reached a ninth edition. The articles on reciprocal polars have been expanded into a separate chapter, and a chapter on conical projections has been inserted. Two other books, which may be included among new issues, belong to the handy series of Economic Classics published by Messrs. Macmillan and Co. One consists of select chapters and passages from Adam Smith's "Wealth of Nations"; the other contains the first six chapters of Ricardo's "Principles of Political Economy and Taxation."

Messrs. Swan Sonnenschein and Co. have in the press an important work on the Indian Calendar, written by Mr. Robert Sewell, in collaboration with Mr. Sankara Bâlkrishna Dikshit. The work contains complete tables for the verification of Hindu and Muhammadan dates for a period of 1600 years (A.D. 300 to 1900), and forms an attempt to carry out in practical form the exact fixation of the astronomical phenomena on which the Hindu Calendar depends, and without which no conversion of dates into European reckoning can be safely relied upon. It embraces the whole of India. The calculations have been based on the general tables published by Prof. Jacobi, of Bonn, checked and enlarged by Mr. S. Bâlkrishna Dikshit. The precise position of sun and moon at sunrise on the meridian of Ujjain on the first day of each year of the Luni-solar Calendar during the period referred to is given, and for the Solar Calendar the moment of the sun's passing the first point of Aries in each year is entered in time reckoning. Full details for the addition and suppression of months in the intercalary Luni-solar years are provided; and where necessary the calculations have been made for true as well as mean intercalations. The solar phenomena have, moreover, been computed by both the Ârya and Surya Siddhântas. It is hoped that the volume will form a standard work of reference for chronologists, as well as for all courts and offices in India.

The additions to the Zoological Society's Gardens during the past week include a Giraffe (*Giraffa camelopardalis*, ♀) two Sable Antelopes (*Hippotragus niger*, ♂ ♀) two Brindled Gnus (*Connochætes taurina*, ♂ ♀), a Levaillant's Cynictis (*Cynictis penicillata*) from South Africa, two great Eagle Owls (*Bubo maximus*), European, purchased; two Rock-hopper Penguins (*Eudyptes chrysocome*) from New Zealand, four Black Francolins (*Francolinus vulgaris*) from India, a Robben Island Snake (*Coronella phocarum*) from South Africa, deposited; a Black-headed Gull (*Larus ridibundus*), British, presented by Mrs. Rees Davis; a —— Buzzard (*Buteo*, sp. inc.) from South Africa, presented by Mr. J. E. Matcham; a Robben Island Snake (*Coronella phocarum*) from South Africa, presented by Dr. Arthur D. Bensusan.

OUR ASTRONOMICAL COLUMN.

Spectroscopic Measures of Planetary Velocities.—A new feature in the application of the Doppler-Fizeau principle has been recently brought forward by M. Deslandres (*Comptes rendus*, Feb. 25). It is to the effect that when we observe the spectrum of a body shining by reflected light the displacement of the lines due to movements in the line of sight depends upon the movement of the body with respect to the original source of light, as well as on its movement with regard to the observer.

The truth of this principle is demonstrated by an investigation of the rotation of Jupiter which M. Deslandres has carried out with his usual skill. The equatorial linear velocity of the planet is 12·4 kilometres, and the difference of the velocities of the two extreme edges 24·8 kilometres; actual measurements of the spectrum photographs taken near opposition, however, show a relative movement of twice this amount. The best results appear to have been obtained by allowing the equator of the planet to lie along the slit of the spectroscope, in which case the effect of the displacements at different distances from the centre is obviously to produce an inclination of the lines of the planet spectrum to the lines of the comparison spectrum, and this inclination affords the means of determining the velocities. This method has the advantage that the effects of small movements of the image on the slit during the long exposure necessary with the great dispersion employed are of little consequence; movements in declination will have no effect on the inclination of the lines, and movements in right ascension will only tend to make them somewhat more diffuse.

M. Deslandres points out that the new principle may possibly have many important applications in connection with planetary velocities, among which he specially mentions the determination of the rotation period of Venus, and even possibly of the solar parallax, the latter being derived from the radial velocity of Venus. M. Poincaré shows that M. Deslandres' results are quite in accordance with theoretical considerations.

The Satellites of Mars.—Prof. Campbell, of the Lick Observatory, took advantage of the recent opposition of Mars to secure a long series of micrometric measurements of the satellites with the 3-foot telescope (*Astr. Journal*, No. 337). The reduction of the observations of Phobos shows that the eastern elongation distance was nearly a second greater than the western, whereas Hall's observations in 1877 showed that the distance at western elongation was then about 2″·2 greater

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than the eastern. "If the orbit had remained unchanged from 1877, the western distance in 1894 should have been about 1″·8 greater than the eastern. The change of nearly 2″·8 was evidence of a marked transformation of the orbit during the years 1877–94. The line of apsides has probably revolved owing to a polar compression of the planet." The observations also appear to indicate a similar transformation of the orbit of Deimos, but the evidence is not quite so conclusive.

Both satellites are about 6 minutes behind Marth's ephemeris, so that the adopted values of their periodic times require slight correction.

Eclipse of the Moon, March 11.—The following particulars with regard to the total eclipse of the moon on the morning of Monday, March 11, may be of interest:—

	G. M. T.	
	h.	m.
First contact with penumbra	0	58·4
,, ,, shadow	1	53·9
Beginning of total phase	2	51·8
Middle ,, ,, ...	3	39·2
End ,, ,, ...	4	26·6
Last contact with shadow	5	24·5
,, ,, penumbra	6	20·0

The first contact with the shadow will occur at 127° from the north point of the moon's limb towards the east, and the last contact at 69° towards the west, in both cases for the direct image as seen with the naked eye. The magnitude of the eclipse (moon's diameter = unity) will be 1·619.

The moon will be seen in the shadow at places between longitudes 5h. E. and 12h. W. Among the principal stars occulted during the eclipse will be 83 Leonis, mag. 7·5, which will disappear at 2h. 17m. at an angle of 95° and reappear at 3h. 12m. at an angle of 338°; and τ Leonis, mag. 5·0, which will disappear at 2h. 56m. at 86°, and reappear at 3h. 43m. at an angle of 345°; the angles being reckoned from north towards east.

THE NILE.[1]

I AM to speak to you to-night of the Nile, and I think I may fairly say it is the most famous river in all the world famous through all the ages, for the civilisation that has existed on its banks; famous for its mystic fabulous rise, about which so many sages and philosophers have pondered; famous for its length, traversing one-fifth the distance from pole to pole; famous, and apparently destined to be famous, for the political combinations that ever centres around it. But I feel I must begin by an apology, for now that Egypt has come so completely within the tourist's range, probably many of my hearers have seen more of the Nile than I have.

If a foreigner were to lecture to his countrymen about the river Thames, and were to begin by informing them that he had never been above Greenwich, he might be looked upon as an impostor; and perhaps I am not much better, for I have never been higher up the river than Philæ, 610 miles above Cairo. For information regarding anything higher up, I must go, like you, to the works of Speke, Baker, Stanley, and our other great explorers. I shall not, then, detain you to-night with any elaborate account of this upper portion of the river, but will only remind you briefly of that great inland sea, the Victoria Nyanza, in extent only a little less than the American Lake Superior, traversed by the equator, and fed by many rivers, some of them taking their rise as far as 5° S. lat. These rivers form the true source of the Nile, the mystery only solved in the present generation.

The outlet of this great lake is on its north shore, where the river rushes over the Ripon Falls, estimated by Speke at only 400 or 500 feet wide, and with a drop of 12 feet. Thence the river's course is in a north-west direction for 270 miles, to where it thunders over the Murchison Falls, a cliff of 120 feet high. Soon after that it joins the northern end of Baker's Lake, the Albert Nyanza, but only to leave it again, and to pursue its course through a great marshy land for more than 600 miles, to where the Bahr Gazelle joins it from the west; a little further down the great Saubat tributary comes in on the east. This is the region in which the river is obstructed by islands of floating vegetation, which, if checked in their course, at last block up its whole width, and form solid obstructions known as *sadds*, substantial enough to be used as bridges, and obstacles, of course, to navigation, until they are cleared away. The waters of the Saubat are of very light colour, and tinge the whole river, which, above its junction, is green and unwholesome, from the long chain of marshes which it traverses. Hence it is called the White Nile. 600 miles further brings us to Khartoum, where the Blue Nile from the Abyssinian mountains joins it, and at 200 miles still further to the north it is joined by the Atbara river, also from Abyssinia, a torrent rather than a river.

Baker gives a graphic account of how he was encamped by the dry bed of the Atbara on June 22, 1861. The heat was intense, the country was parched with drought. During the night the cry went forth that the floods were coming, and in the morning he found himself on the banks of a river, he says, 500 yards wide and from 15 to 20 feet deep. All nature had sprung into life. A little north of the junction of the Atbara is Berber, whence you will remember is the short cut to Suakin in the Red Sea, which so many thought would have been the true route for our Army to take in relieving Gordon. From Khartoum to Assouan is a distance of 1100 miles of river, during which it makes two immense curves, for on a straight line the distance is not half so much, and it is in this part of its course that it passes over the six great cataracts or rapids which block all ordinary navigation. The first or furthest north cataract is just above Assouan, a distance of 750 miles from the Mediterranean, through the country known as Egypt. From the junction of the Atbara to its mouth in the Mediterranean, a distance of 1680 miles, the Nile receives no tributary. On the contrary, during every mile of its course its waters are diminished by evaporation, by absorption, and by irrigation. The river gets less and less as it flows through this rainless land, and its maximum volume is to be found during the floods at the junction of the Atbara, and at other seasons at Khartoum, 1875 miles from the Mediterranean.

The whole distance by river from the Victoria Nyanza to the sea is about 3500 miles. It may not be easy to derive any clear impression from this bare recital of mileage. Let me try to convey to you in some other ways the idea of the length of the Nile. Standing on the bridge at Cairo, I used to reflect that I was just about half-way between the source of the Nile and the White Sea. Or to put it another way: if we could suppose a river crossing our English Channel, and that the Thames should find its outlet in the Euphrates and the Persian Gulf, that river would be about as long as the Nile.

In this short sketch of the course of the Nile, I must not forget to mention one interesting feature. About 40 miles south of Cairo, the low Libyan chain of hills which bounds the Nile valley on the west is broken by a gap, through which the waters of the river can flow, and beyond this gap lies a saucer-shaped depression called the Fayúm, of about 400 square miles in area, sloping down to a lake of considerable size, the surface of whose waters stands about 130 feet below that of the sea. This lake is known as the Birket el Kurún.

From the time of the earliest Egyptian records, this province of the Fayum was famed for its fertility, and to the Egyptian taste for its delightful climate. Many of the most precious monuments of antiquity have been found in the Fayúm. The famous Labyrinth is supposed to have stood just at its entrance; and what has excited most interest for the engineer in all times, it is here that Herodotus places that wonderful lake Mœris, which receiving for half the year the surplus supply of the Nile, rendered it back again in irrigation to Lower Egypt during the other half. Where this lake actually was, has excited discussion since any attention has been paid to ancient Egyptian history. It seems pretty clear that in earlier days the Birket el Kurún was of much greater proportions than it is now, but how it ever could have been large enough to allow of its waters flowing back into the Nile valley when the river was low, without at the same time drowning the whole Fayúm, is not very clear.

Now, what are the functions of a great river, what are the offices which it renders to man? And first of all, at least in this latitude, we would mention the carrying off to the ocean of the surplus water that descends from the skies. Nobly does the Nile fulfil this duty; but with this enormous qualification, that it transports the water from tracts where there is too much, and carries it all free of cost, not to waste it in the sea, but to

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[1] A lecture delivered at the Royal Institution, on January 25, by Sir Colin Scott-Moncrieff.

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